



**MISSOURI DEPARTMENT OF TRANSPORTATION
MATERIALS ENGINEERING
Jefferson City, Missouri**

**Test Method
MoDOT T47
DETERMINATION OF AVAILABLE ALKALIES IN FLY ASH**

1.0 SCOPE

1.1 This method describes a procedure for determining the percent Available Alkalies in Fly Ash using Atomic Absorption Spectrophotometry.

2.0 REAGENTS AND APPARATUS

2.1 An Atomic Absorption Spectrophotometer.

2.2 Calcium Hydroxide ($\text{Ca}(\text{OH})_2$), Reagent Grade, low alkali.

2.3 Hydrochloric Acid (HCl), specific gravity 1.19.

2.4 Sodium Chloride (NaCl), Reagent Grade, dried at 105-110C for several hours prior to use.

2.5 Potassium Chloride (KCl), Reagent Grade, dried at 105-110C for several hours prior to use.

2.6 Lithium Chloride (LiCl), Reagent Grade.

2.7 Lithium Solution, 1.Percent. Dissolve 6.11 g LiCl in distilled water, transfer to a 100 ml volumetric flask and dilute to volume with distilled water.

3.0 PREPARATION OF STANDARD SOLUTIONS

3.1 2.70% Na_2O and 1.20% K_2O Standard Solution:

Prepare a $\text{Ca}(\text{OH})_2$ solution as described in ASTM C 311-77, Sections 18.1 through 18.3, omitting the addition of a sample to the $\text{Ca}(\text{OH})_2$ (place 2.0 g of $\text{Ca}(\text{OH})_2$ in the plastic vial) and adding exactly 25 ml of 1:3 HCl instead of 5 ml. Prior to diluting to volume as described in 18.3, accurately weigh into the 500 ml volumetric flask 0.0953 g dried KCl and 0.2542 g dried NaCl , and dilute to volume with distilled water. Then, make a 20/200 dilution followed by another 20/200 dilution, pipetting 4 ml of 1.0 percent Li solution into the final dilution prior to diluting to volume. This final dilution is equivalent to 1.20% K_2O and 2.70% Na_2O .



3.2 Blank Solution: prepare a blank solution as described in Section 3.1, omitting only the addition of KCl and NaCl.

4.0 PROCEDURE

4.1 Prepare the sample as described in ASTM C 114-77; Sections 18.1 through 18.3 except add exactly 25 ml of 1:3 HCl instead of the 5 ml specified in Section 18.3. After the sample has been diluted to volume as described in Section 18.3, proceed as follows: Make a 20/200 dilution followed by another 20/200 dilution, pipetting 4 ml of 1.0 percent Li solution into the final dilution prior to diluting to volume.

4.2 Calibrate the instrument using the blank solution and the Na₂O and K₂O standard solution, then determine percent Na₂O and percent K₂O on the sample solution.

5.0 CALCULATION AND REPORT

5.1 The method of calculation will vary with the make and model of instrument used. Report the available alkalies as equivalent percentage of sodium oxide (Na₂O), calculated as follows:

$$\text{Equivalent Na}_2\text{O, \%} = \text{Na}_2\text{O \%} + (0.658 \times \text{K}_2\text{O, \%})$$